Preliminary

General Description

The MSU30x2 is a monolithic talking microcomputer that can memorize voice up to 60/90/120 seconds using MOSEL qualified coding method(MPCM). It's an integration of traditional 4-bit microcomputer and voice chip with minimal external components. LCD driver and miscellaneous interface are provided for versatile applications. With more than bit 10K ROM/RAM inside, this chip meets every intelligent novelty. Customer requested function and voice data will be built in by changing masks during fabrication.

Hardware Features

- Low current consumption
- Maximal function with minimal cost
- Current output could drive 8 ohm speaker with a transistor, Vout could drive buzzer directly.
- The voice content is stored up to 120 seconds at 6 KHz (B0000h) and can be separated to 256 sections.
- Duration of each section can be different and is multiples of 100h.
- Duration of section with appended memory-less mute is up to 40 seconds (100000h).
- Each trigger can access a sentence, up to 256 sentences could be access. 1024 entry count are provided.
- Working at 2.4V through 6.0V
- Precise voice sample rate 8 KHz is provided.
- Auto ramp up and ramp down.
- Halt mode is provided. Very low current consumption at Halt mode.
- LCD driver provided, can drive up to 75 segments
- Built-In clock generator
- Built-In doubler, halver, tripler
- Internal program ROM : 1024 x 15 bits;
- Internal program RAM : 64 x 4 bits
- Internal stack RAM: 4x10 bits.
- Two 4-bit input ports
- Two 4-bit input/output ports
- One 4-bit output port

Software Features

- 76 instructions, in 39 mnemonics
- 4-level subroutine nesting (also used for interrupt)
- Two external factors (INT, S&M) for interrupt
- Two internal factors (timer, divider) for interrupt

Sample Applications

- handy game with LCD
- versatile timepiece with LCD
- talking timer with LCD
- intelligent calculator with LCD
- smart stationery with LCD
- talking home electronics with LCD
- talking education kit with LCD

Development Supports

- Development tools are provided
- Software / Hardware programming guide is provided
- OTP U73061 is to be available

MSM9068 Developing Card
MSM9088 Program code emulation board
MSM9018 120" Sound emulation board

Development Supports

- Pid321 Voice Smart Programmer's Guide
- Pid345 Voice Smart ICE M9068 User's Manual

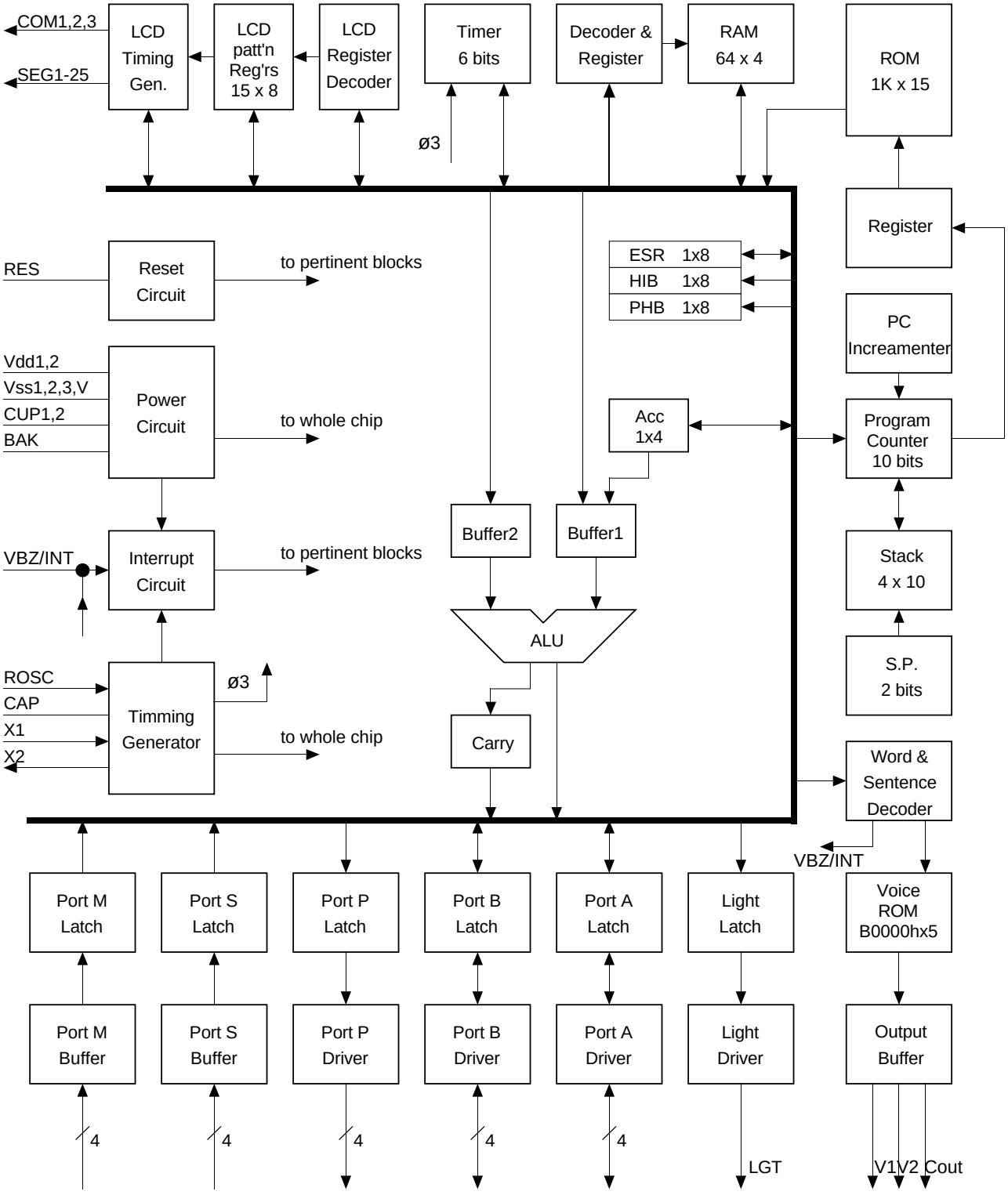
Mask Options

- either open or hold transistor on S port & M port
- either pull down or pull up on Interrupt switch
- either leading edge or trailing edge on Interrupt edge
- either power back-up activated or not when power on
- either with reset or not when power on
- either 8 ms or 2 ms chattering removal time on S port & M port
- either slow (by 15.625 ms) or fast (by 224.14 us) set time timer
- either fast system clock (Fosc) or slow system clock (Fosc / 2)
- either Rosc or 32768 Hz crystal to play voice
- LCD display frequency : (1) 128 Hz /170.7 Hz (2) 64Hz /85.3 Hz (3) 32Hz /42.7Hz
- LCD driver : (1) static (2) 1/2 bias 1/2 duty (3) 1/2 bias 1/3 duty

Capacity of each device

	Device	Voice ROM Size	Word Count	Sentence Count	Entry Count	LCD segment	LCD	LCDB	LCDP
1	U3042	B0000hx5	256	256	1024	25x3	Yes	Yes	Yes
2	U3032	81000hx5	256	256	1024	25x3	Yes	Yes	Yes
3	U3022	58000hx5	256	256	1024	25x3	Yes	Yes	Yes

Block Diagram



Signal Summary

dice Pad #	84L PLCC pin #	Signal symbal		Active	I/O	Functions
63		Vdd1	1		Power	Positive power supply for CPU function block
64		Vreg	1		O	Voltage regulator
65, 66		CUP1,2	2		I	Voltage doubler capacitor
67		X1	1		I	Crystal Oscillator input, 32768 Hz
68		X2	1		O	Crystal Oscillator Output, 32768 Hz
69		COM1	1		O	Common plate for LCD panel
70, 1-24		SEG1-25	25		O	25 segment outputs for LCD panel
25, 26		COM3,2	2		O	Common plate for LCD panel
27		BAK	1		Power	Negative power supply
28, 29		Vss1,2	2		Power	BackUp negative power supply
30, 31		S4,S3	2		I	One-way input port; note 1
32		LGT	1		O	Output port
33-36		IOA1-4	4		I/O	Bidirectional Input / output port
37		RES	1	H	I	System reset
38		NC2	1			No connection
39		NC3	1			No connection
40		Vdd2	1		Power	Positive supply for voice function block, internally connected to pad Vdd1
41		Rosc	1		I	Oscillator Resistor for voice function block
42		VssV	1		Power	Negative power supply for voice signal
43		Cout	1		O	Audio signal current output
44, 45		Vout1,2	2		O	Audio signal voltage output
46-48		IOB1,2,3	3		I/O	Bidirectional Input / Output port
49		NC1	1		I/O	No connection
50		IOB4	1			Bidirectional Input / Output port
51		VBZ/INT	1		I/O	Busy status output; internally connected to INT (interrupt request) pin of CPU
52-55		P1,2,3,4	4		O	One-way output port, 4 bits
56-59		M1,2,3,4	4		I	One-way input port; note 1
60		NC4	1		NC	No connection
61,62		S2,1	2		I	One-way input port, note 1

Note 1. with chatter removal time for either 8 ms (ph8) or 2 ms (ph6)

Signals Descriptions

Cout
Cout is tristate during standby.
Cout has zero current output when sound data is zero. Cout has full current output when sound data is the highest. Cout has half of full current output when sound is silence at middle data value. Cout has half of full current output when playing sound at appended memory-less mute.
The bypass Cout Resistor is used to bypass the audio output current from Cout. This bypassing extra current to ground gives a way to prevent the saturation of audio waveform amplified by transistor. This Resistance is 470 ohm typically. It always is not very small. Or user can let it open if the transistor has a fair beta value.
A transistor with beta value 150 is sufficient for typical applications. Larger beta value get larger sound but may have the amplified waveform saturated.

Vout1, Vout2
They are tristate during standby state.
These two pins can drive buzzer directly. The piezo buzzer used should have its resonant frequency at the center of your sound frequency domain or you are unable to play you sound good by this buzzer.
For instance, you have your sound spans over frequency from 100 Hz through 1 KHz. A buzzer with resonant frequency at 300 Hz will play this sound good. A buzzer with resonant frequency at 1 KHz will distort the sound very much because that most of the energy of the playback sound is unable to be played by this buzzer.
When using precise sample rate, these Vout 1 & 2 do not work.

Terms

to be available

Absolute Maximum Rating (Vdd=3.0V, Vss=Vss2=0.0V, Vss3=0.0V/-1.5V)

Symbol	Rating	Unit
Vss1	1.2-1.8	V
BAK	0.0-0.6	V
Vreg	0.0-0.6	V
CAP	Vreg-Vd	V
X1	Vreg-Vdd	V
S1,2,3,4	Vss-Vdd	V
M1,2,3,4	Vss-Vdd	V
(IOA1,2,3,4)TG0,1,2,3	Vss-Vdd	V
IOB1,2,3,4	Vss-Vdd	V
VBZ/INT	Vss-Vdd	V
RESET	Vss-Vdd	V

Symbol	Rating	Unit
Rosc	Vss-Vdd	V
X2	Vreg-Vdd	V
PWR(ALM)	Vss-Vdd	V
#EB2	Vss-Vdd	V
P1,2,3,4	Vss3-Vdd	V
SEG1-25	Vss3-Vdd	V
COM1,2,3	Vss3-Vdd	V
CUP1,2	Vss3-Vdd	V
Vout1,2	Vss-Vdd	V
T(operating)	-60-+60	Degree C
T(storage)	-55-+125	Degree C

Common Plate Usage

	Static	1/2 duty	1/3 duty
COM1	V	V	V
COM2	-	V	V
COM2	-	-	V
Alternating Frequency	32 Hz	32 Hz	43 Hz

Operating Conditions

Timing	Description	Min.	Typ.	Max.	Unit	Condition
T A	Ambient temperature under bias	0	2.5	70	℃	
Vdd	Snpply voltage	2.4	4.5	6.0	V	Vss=0V
Xosc	Oscillation frequency for CPU	32768	32768	32768	Hz	
Vosc	Oscillation frequency for playing voice		6000		Hz	

AC Characteristics at 4.5 V & 6 KHz S.R.

Timing		Min.	Typ.	Max.	Remarks

DC Characteristics at 3.0 Vdd

Symbol	Name	Valid	Min.	Typ.	Max.	Unit	Remarks
I sb	stand by I	Vdd	-	8	-	uA	
I op	operation I	Vdd	-	100	-	uA	
I ohv	output high I	Vouts	-	-	-	mA	
I oLv	output low I	Vouts	-	-	-	mA	
I co	cuurent output	Cout	-	2.5	-	mA	
		Cout	-	-	-	mA	
d F/F	frequency stability		-5	-	5	%	[Fosc(3.0V)-Fosc(2.7V)]/Fosc(3.0V)
d F/F	frequency variation		-10	-	10	%	6 KHz S.R., 680 kohm Rosc
R osc	oscillation R	Rosc	-	680	-	kohm	S.R.=6000 Hz
		Rosc	-	620	-	kohm	S.R.=8000 Hz

DC Characteristics at 4.5 Vdd

Symbol	Name	Valid	Min.	Typ.	Max.	Unit	Remarks
I sb	stand by I	Vdd	-	10	-	uA	
I op	operation I	Vdd	-	500	-	uA	
I ohv	output high I	Vouts	-	-	-	mA	
I oLv	output low I	Vouts	-	-	-	mA	
I co	current output	Cout	-	4	-	mA	
		Cout	-	-	-	mA	
V ohp	o/p high V	P port	*-0.4V	-		V	I oh = -400 uA
V oLp	o/p low V	P port		-	*+0.4V	V	I oL = 400 uA
V ohw	o/p low V	PWR	*-0.4V	-		V	I oh = -1 mA
V oLw	o/p high V	PWR		-	*+0.4V	V	I oL = 1 mA
V ohio	o/p low V	i/o port	*-0.4V	-		V	I oh = -100 uA
V oLio	o/p high V	i/o port		-	*+0.4V	V	I oL = 100 uA
V ohc	o/p low V	Com	*-0.4V	-		V	I oh = -4 uA
V oLc	o/p high V	Com		-	*+0.4V	V	I oL = 4 uA
V ohg	o/p low V	Seg's	*-0.4V	-		V	I oh = -0.4 uA
V oLg	o/p high V	Seg's		-	*+0.4V	V	I oL = 0.4 uA
d F/F	frequency stability		-5	-	5	%	[Fosc(4.5V)-Fosc(4.0V)]/Fosc(4.5V)
d F/F	frequency variation		-10	-	10	%	6 KHz S.R., 680 kohm Rosc
R isn	input R when on	S port	-	330	-	kohm	pulldown X'tor=on & note 1
R isf	input R when off	S port	-	30	-	kohm	pulldown X'tor=off, halt mode & note 1
R imn	input R when on	M port	-	30	-	kohm	pulldown X'tor=on & note 1
R imf	input R when off	M port	-	30	-	kohm	pulldown X'tor=off, halt mode & note 1
R inh	input R	VBZ,INT	-	140	-	kohm	Vss2=0V, Vi=Vdd, VBZ=high
R inL	input R	VBZ,INT	-	3	-	kohm	Vss2=0V, Vi=Vdd, VBZ=low
R ir	input R	RESET	-	18	-	kohm	Vss2=0V, Vi=Vdd
R osc	oscillation R	Rosc	-	680	-	kohm	S.R.=6000 Hz
		Rosc	-	620	-	kohm	S.R.=8000 Hz
			-		-		
			-		-		

Note 1. Vss2=0V, Vi=Vss2+0.4V Note 2. *:= Vdd

Instruction Set Summary

	Syntax		Description
1	ADC	A, Rm	Addition with Carry
2	ADC	Wn, d	"
3	ADCS	A, Rm	ADC and store
4	ADCS	Wn, d	"
5	ADD	A, Rm	addition
6	ADD	Wn, d	"
7	ADDS	A, Rm	ADD and store
8	ADDS	Wn, d	"
9	ADL	A, Rm	addition logical
10	ADL	Wn, d	"
11	ADLS	A, Rm	ADL and store
12	ADLS	Wn, d	"
13	AND	A, Rm	move the AND result to Accumulator
14	AND	Wn, d	"
15	ANDS	A, Rm	AND and store
16	ANDS	Wn, d	"
17	CALL	d10	call the subroutine at address d10
18	CLRM	d7	turn the LGT and clear modes
19	CLRS	d9	clear setting
20	HALT		halt the processor
21	IN	Rm, PA	input to Rm from port A
22	IN	Rm, PB	input to Rm from port B
23	IN	Rm, PS	input to Rm from port S
24	IN	Rm, PM	input to Rm from port M
25	INM	Rm, PA	input to Rm from port g
26	INM	Rm, PB	"
27	JC	d10	jump if Carry set
28	JMP	d10	jump absolute
29	JNC	d10	jump if non-Carry
30	JNZ	d10	jump if non-zero
31	JPK	d10	jump on bit k value
32	JZ	d10	jump if zero
33	LCD	Lx, Rm	write number to LCD w/zero
34	LCDB	Lx, Rm	write number to LCD w/blank
35	LCDP	Lx, Rm	write pattern to LCD
36	MOV	HI, d8	move data to HIB
37	MOV	PH, d5	move data to port halt interrupt release byte
38	MOV	Rm, SR2	move ESR to register Rm
39	MOV	Rm, SR1	"
40	MOV	A, Rm	move data to Accumulator from Rm

Instruction Set Summary (Continued)

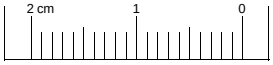
	Syntax		Description
41	MOV	Rm, A	move data from Accumulator to Rm
42	MOV	Wn, Rm	move Rm to Accumulator and Wn
43	MOV	CF, Rm	move data from Rm3 to Carry flag
44	MOV	RM, d	move data to Accumulator from Rm
45	MOV	Rm, Wn	"
46	MOV	ALM, 00h	actviate a sentence out of 256
47	MOV	TM, d6	move data to timer and start
48	MOV	Rm, CF	move data from Carry flag
49	MOV	IC, d4	move data to inerrupt control byte
50	NOP		no operation
51	OR	A, Rm	move the OR result to Accumulator
52	OR	Wn, d	"
53	ORS	A, Rm	OR and store
54	ORS	Wn, d	"
55	OUT	PA, Rm	output from Rm and setting
56	OUT	PB, Rm	"
57	OUT	PP, Rm	output data to port P
58	OUTS	Rm, d	output data to port P serially
59	RET		return from subroutine
60	SBC	A, Rm	subtraction with Carry
61	SBC	Wn, d	"
62	SBCS	A, Rm	SBC and store
63	SBCS	Wn, d	"
64	SETM	d7	turn the #EB2 and set modes
65	SL0	Rm	shift register left and moving
66	SL1	Rm	"
67	SR0	Rm	shift register and moving
68	SR1	Rm	"
69	SUB	A, Rm	subtraction
70	SUB	Wn, d	"
71	SUBS	A, Rm	SUB and store
72	SUBS	Wn, d	"
73	XOR	A, Rm	move the XOR result to Accumulator
74	XOR	Wn, d	"
75	XORS	A, Rm	XOR and store
76	XORS	Wn, d	"

Note. Refer to Voice Smart Programmer's Guide (pid321) for details of each instruction.

COB Information I

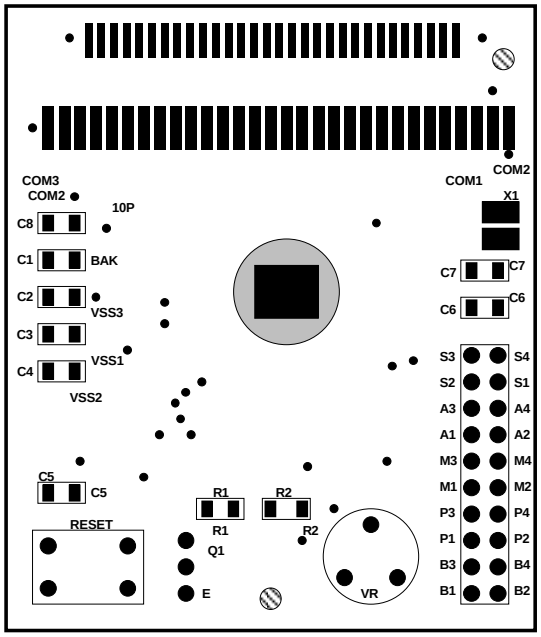
Silk screen & copper print

COB model number : M9201
Chip bonded : U30x2



Legend

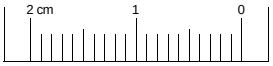
- Copper pad for X'tal
- Copper pad for LCD
- Copper pad for LCD
- Copper pad
- Through hole
- Through hole
- Alignment hole for Jig

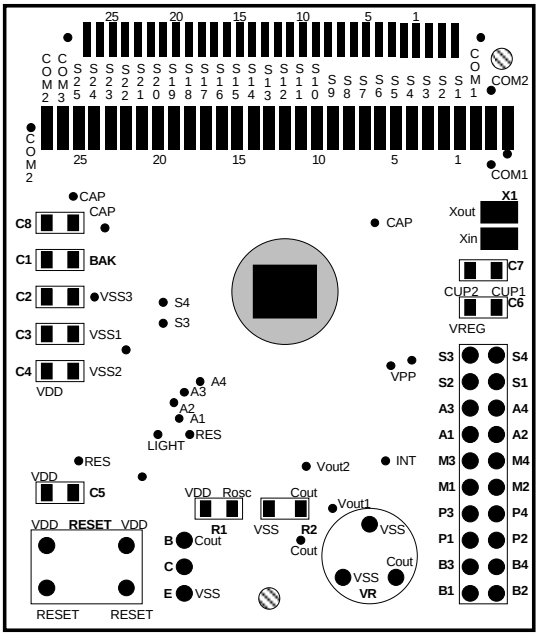


COB Information II

Signal Name & Location Description

COB model number : M9201
Chip bonded : either U30x2
Please refer previous page for legends





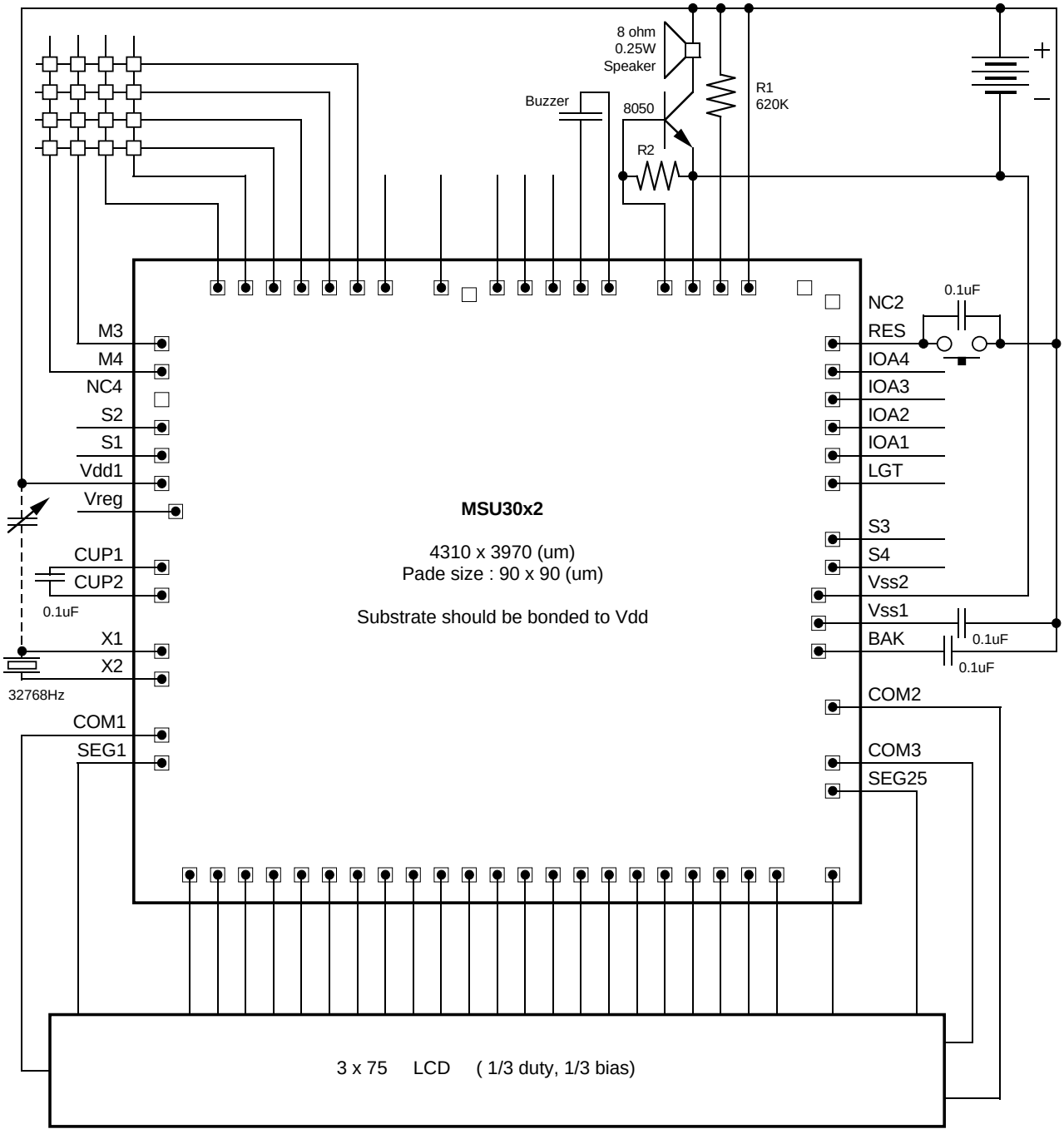
Timing Diagram

To be Available soon

Standard Code Line Up

To be Available soon

Typical Application Circuit



Note: All the above components need to adjust possibly case by case to meet required performance.

Bonding Pad Information

Pad No.	Designation	X	Y	Pad No.	Designation	X	Y
1	SEG2	-1775	-1827	36	IOA4	1985	1156
2	SEG3	-1618	-1827	37	RES	1986	1349
3	SEG4	-1450	-1827	38	NC2	1995	1657
4	SEG5	-1294	-1827	39	NC3	1905	1824
5	SEG6	-1126	-1827	40	Vdd2	1525	1827
6	SEG7	-970	-1827	41	ROSC	1300	1827
7	SEG8	-801	-1827	42	VssV	1080	1827
8	SEG9	-645	-1827	43	COUT	920	1827
9	SEG10	-477	-1827	44	VOUT1	625	1826
10	SEG11	-321	-1827	45	VOUT2	408	1826
11	SEG12	-153	-1827	46	IOB1	254	1826
12	SEG13	3	-1827	47	IOB2	87	1826
13	SEG14	171	-1827	48	IOB3	-58	1826
14	SEG15	327	-1827	49	NC1	-252	1783
15	SEG16	495	-1827	50	IOB4	-430	1826
16	SEG17	651	-1827	51	VBZ/INT	-654	1826
17	SEG18	820	-1827	52	P1	-821	1826
18	SEG19	976	-1827	53	P2	-967	1826
19	SEG20	1144	-1827	54	P3	-1132	1826
20	SEG21	1300	-1827	55	P4	-1277	1826
21	SEG22	1468	-1827	56	M1	-1458	1827
22	SEG23	1625	-1827	57	M2	-1685	1827
23	SEG24	1995	-1757	58	M3	-1995	1627
24	SEG25	1995	-1127	59	M4	-1995	1401
25	COM3	1995	-943	60	NC4	-1995	1191
26	COM2	1995	-707	61	S2	-1995	1015
27	BAK	1908	-416	62	S1	-1995	789
28	Vss1	1908	-275	63	Vdd1	-1995	629
29	Vss2	1932	-129	64	VREG	-1962	467
30	S4	1986	31	65	CUP1	-1994	56
31	S3	1986	257	66	CUP2	-1994	-158
32	LGT	1985	519	67	X1	-1995	-464
33	IOA1	1985	700	68	X2	-1995	-633
34	IOA2	1985	846	69	COM1	-1995	-955
35	IOA3	1985	1011	70	SEG1	-1995	-1138

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Specifications subject to change without notice, contact your sales representatives for the most recent information.

T O : Mosel Vitelic Inc. 886-3-5772788 (fax)
Attention : Sales & Marketing Department

MSU3042

3 digit production code
filled by MVI only

Product Request Form

We hereby request MVI to start preparing produce MSU3042 which is specified as below descriptions titled ☐ as well as form A and form(s) B and form(s) C.

I already read this data sheet pid 262* and understand MSU3042 completely and know how to specify to fit my requirement. The voice length limit is B0000h.

General Descriptions		Chip Descriptions	
Customer	_____ No proceeding if empty	Title	
Agent		SampleRate	☐ 8KHz by 32768 Hz X'tal ☐ _____ Hz
Sales Represen.	_____ Who is MVI sales you contact ?		
Sound Providing to MVI	☐ 8-bit PCM sound files ☐ .WAV sound files ☐ DAT or equivalent ☐ Something special in written memo ☐ Others _____	Output Device	☐ Buzzer (F fr= 1K Hz) ☐ Speaker (8 ohm, 1" diam) ☐ Other _____
Code Providing to MVI	☐ .TRA program file, name = _____ ☐ .EVA LCD file, name = _____ ☐ .HEX program file, name = _____ ☐ .HEX LCD file, name = _____	Working Voltage	☐ 2.5 V ☐ 3.0 V ☐ 3.5 V ☐ 5.0 V ☐ 4.0 V ☐ 5.5 V ☐ 4.5 V ☐ 6.0 V
Serviced Required from MVI	☐ EPROMs with data inside for M9018 ☐ files to pro'med into EPROM ☐ U73061 OTP chip ☐ Confirm table ☐ Others _____	Power Source	☐ Battery size "D" ☐ Battery size "AA" ☐ Battery size "AAA" ☐ Battery button cell ☐ Mains ☐ Other _____

Phone # : _____ Fax # : _____
Company Name : _____
Signature : _____ Date: _____
Name Typed : _____
Position Title : _____
Department, Section : _____

Hardcopy of cover page of U3032, U3022 PRF (product request form) are provided per request.

TITLE	

Product Request Form A : Mask Definitions

	Mask options	Selections		
1	Power bias	☑ Li - 1/2 Bias		
2	LCD driver & display frequency	☐ 1/2 duty 128 Hz	☐ 1/2 duty 64 Hz	☐ 1/2 duty 32 Hz
		☐ 1/3 duty 170.7 Hz	☐ 1/3 duty 85.3 Hz	☐ 1/3 duty 42.7 Hz
		☐ Static 128 Hz	☐ Static 64 Hz	☐ Static 32 Hz
3	S-port defined	☐ Open	☐ Hold transistor	
4	M-port defined	☐ Open	☐ Hold transistor	
5	Interrupt switch	☐ Pull down	☐ Pull up	
6	Interrupt edge	☐ Rising	☐ Falling	
7	Power-on mode	☑ BackUp	☐ Non-BackUp	
8	External Reset	☐ and PowerOn reset	☐ Only	
9	note Chatter Removal time	☐ 8 mS time	☐ 2 mS time	
10	note Set time	☐ Slower (Tk=512 mS)	☐ Faster (Tk=8000uS)	
11	Oscillator	☑ Crystal		
12	System Clock	☐ Fast (Fosc)	☐ Slow (Fosc/2)	
13	Alarm frequency	☑ Level shift		
14	P-port	☑ Level shift		
15	note Input port signal	☑ Level shift		
16	Light mode	☑ Always		
17	Reset level	☑ High		
18	I/O port	☑ Level shift		
19	Light	☑ Level shift		

Note 9 : For S port and M port
Note 10 : Set time = (set value + 1) * Tk / Fosc ; Fosc is in KHz
Note 15 : Input port control signal level shift, J48, J49

☐ How many words are defined ? (1≤ ≤ 256)
And Forms are attached: ☐B1 ☐B2 ☐B3 ☐B4

☐ How many sentences are defined ? (1≤ ≤ 256)
And Forms are attached: ☐C1 ☐C2 ☐C3 ☐C4 ☐C5 ☐C6 ☐C7 ☐C8

Product Request Form B1 : Voice Word Definitions

T I T L E

There are 1≤ ≤64 words defined on this form.

Address	Voice Description	VoiceLength		MuteLength		WordTotal ≤ 100000h
00		s	00h	s	00h	00h
01		s	00h	s	00h	00h
02		s	00h	s	00h	00h
03		s	00h	s	00h	00h
04		s	00h	s	00h	00h
05		s	00h	s	00h	00h
06		s	00h	s	00h	00h
07		s	00h	s	00h	00h
08		s	00h	s	00h	00h
09		s	00h	s	00h	00h
10		s	00h	s	00h	00h
11		s	00h	s	00h	00h
12		s	00h	s	00h	00h
13		s	00h	s	00h	00h
14		s	00h	s	00h	00h
15		s	00h	s	00h	00h
16		s	00h	s	00h	00h
17		s	00h	s	00h	00h
18		s	00h	s	00h	00h
19		s	00h	s	00h	00h
20		s	00h	s	00h	00h
21		s	00h	s	00h	00h
22		s	00h	s	00h	00h
23		s	00h	s	00h	00h
24		s	00h	s	00h	00h
25		s	00h	s	00h	00h
26		s	00h	s	00h	00h
27		s	00h	s	00h	00h
28		s	00h	s	00h	00h
29		s	00h	s	00h	00h
30		s	00h	s	00h	00h
31		s	00h	s	00h	00h
32		s	00h	s	00h	00h
33		s	00h	s	00h	00h
34		s	00h	s	00h	00h
35		s	00h	s	00h	00h
36		s	00h	s	00h	00h
37		s	00h	s	00h	00h
38		s	00h	s	00h	00h
39		s	00h	s	00h	00h
40		s	00h	s	00h	00h
41		s	00h	s	00h	00h
42		s	00h	s	00h	00h
43		s	00h	s	00h	00h
44		s	00h	s	00h	00h
45		s	00h	s	00h	00h
46		s	00h	s	00h	00h
47		s	00h	s	00h	00h
48		s	00h	s	00h	00h
49		s	00h	s	00h	00h
50		s	00h	s	00h	00h
51		s	00h	s	00h	00h
52		s	00h	s	00h	00h
53		s	00h	s	00h	00h
54		s	00h	s	00h	00h
55		s	00h	s	00h	00h
56		s	00h	s	00h	00h
57		s	00h	s	00h	00h
58		s	00h	s	00h	00h
59		s	00h	s	00h	00h
60		s	00h	s	00h	00h
61		s	00h	s	00h	00h
62		s	00h	s	00h	00h
63		s	00h	s	00h	00h

Length summation of above 64 words **is** 00h

≤ limit

All words' length sum'n is 00h

Signature & date		MVI Sales & date	

Harcopy of complete set PRF (product request form) pages B2-B4 and C1 - C8 are provided per request.